Comparison between a Classroom and a Web Experiments

—Boiney's Lottery Choice Experiment—

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Abstract

A part of Boiney's classroom experiment was conducted from November 22, 1997 to November 21, 2000 on the Web. We obtained the results similar to Boiney's. The preference patterns that Boiney revealed were even validated in the case that was given a "statistical equivalence instruction." The results show the effectiveness of psychological experiments on the Internet. Moreover, "Reverse Skew Sensitivity" that was theoretically predicted by the author was also observed.

1. Introduction

As the Internet is widely used, psychological experiments, which are traditionally conducted at classrooms in universities, have begun to be conducted on the Web. For example, the Web site of American Psychological Society (APS) links many experiments and surveys: (1) Biological Psychology/Neuropsychology, (2) Clinical Psychology, (3) Cognition, (4) Developmental Psychology, (5) Emotions, (6) General Issues, (7) Health Psychology, (8) Industrial/Organizational, (9) Personality, (10) Sensation and Perception, (11) Social Psychology (http://sych.hanover.edu/ APS/exponnet.html). Birnbaum reports the recent situations of psychological experiments on the Internet [1].

The author conducted a Web experiment on Ellsberg 3-color-Ball problem to explore the possibilities of Web experiments during April 1, 1996 — October 31, 1996. This experiment, with 26 participants, showed the violation of the "sure-thing principle" that has been observed in many classroom experiments. It suggests the possibilities of psychological experiments on the Internet

(http://www.etl.go.jp/~e6930/decision/net-exp/results/1996/results01.shtml). Moreover, a Web experiment on the Japanese version of stock investment decisions confirmed the composite hypotheses on Regret and Elation [2].

2. The Experiment of Boiney

Boiney conducted a lottery choice classroom experiment [3]. The subjects were 130 first-year MBA students in a production and operations management class. The experiment was a fully crossed 2 × 3 × 3, OUTPOUT ($200, -$200) × MEAN (0.2, 0.50, 0.8) × SKEW (negative, symmetric, positive) design where OUTPUT was a between-subject factor. MEAN and SKEW were within-subject factors. The levels of MEAN were factorially combined with the levels of SKEW to form nine ambiguous gambles, each of which was paired with an unambiguous gamble having the same mean. The range of f (p), the second-order distributions of probabilities, rather than the variance, was held constant at 0.20 in all SKEW conditions.

1. Approximately 40% of the subjects exhibit no systematic preference Pattern.
2. About 23% of the subjects exhibit a consistent attitude toward ambiguity: 19 subjects are ambiguity neutral, 5 are ambiguity averse, and 6 are ambiguity seeking.
3. 48 of the 130 subjects (about 37%) are "*skew sensitive*"; they are ambiguity seeking under positive skewness, yet ambiguity averse under negative skewness. That is, Positive Skewness ≻ Unambiguous and Unambiguous ≻ Negative Skewness, regardless of OUTPUT. Boiney assumed transitivity and obtained Skew Sensitivity: **Negative Skewness** ≺ **Unambiguity** ≺ **Positive Skewness**. He did not directly compare between Positive Skewness and Negative Skewness.

4. Methods

The following three lotteries were used: Lottery A, Lottery B and Lottery C.

Lottery A: In Lottery A, there are 30 red bolls in a box.
Lottery B: In Lottery B, there are 2 or 22 red balls in a box.
The possibility of 22 is 90% and the possibility of 2 is 10%.

Lottery C: In Lottery C, there are 18 or 38 red balls in a box.
The possibility of 18 is 90% and the possibility of 38 is 10%.

Problem 1-1 has a gain and Problem 1-2 has a loss. Problem 2-1 is Problem 1-1 plus the instruction “Lottery B and Lottery C are statistically equivalent” (**Statistical Equivalence Instruction**). Problem 2-2 is Problem 1-2 plus the statistical equivalence instruction. In the case of a gain, Lottery B has negative skewness and Lottery B has positive skewness. In the case of a loss, Lottery C has negative skewness and Lottery B has positive skewness. The gain and the loss, and the statistical equivalence instruction are between-subject factors.

Problem 1-1 (Gain)

Lottery A vs. Lottery B

There are 100 red and black balls in total in a box. You win $1,000 if you get a red ball. Nothing for a black ball. Which lottery would you prefer? Please select one of the following options.

"Description of Lottery A" "Description of Lottery B"

Options:

- Of course, I select Lottery A.
- I select Lottery A if I must select one of them.
- No difference.
- I select Lottery B if I must select one of them.
- Of course, I select Lottery B.

Lottery A vs. Lottery C

There are 100 red and black balls in total in a box. You win $1,000 if you get a red ball. Nothing for a black ball. Which lottery would you prefer? Please select one of the following options.

"Description of Lottery A" "Description of Lottery C"

Options:

- Of course, I select Lottery A.

- I select Lottery A if I must select one of them.
- No difference.
- I select Lottery C if I must select one of them.
- Of course, I select Lottery C.

Lottery B vs. Lottery C

There are 100 red and black balls in total in a box. You win $1,000 if you get a red ball. Nothing for a black ball. Which lottery would you prefer? Please select one of the following options.

"Description of Lottery B" "Description of Lottery C"

Options:

- Of course, I select Lottery B.
- I select Lottery B if I must select one of them.
- No difference.
- I select Lottery C if I must select one of them.
- Of course, I select Lottery C.

Problem 1-2 (Loss)

Lottery A vs. Lottery B

There are 100 red and black balls in total in a box. You lose $1,000 if you get a red ball. Nothing for a black ball. Which lottery would you prefer? Please select one of the following options.

● ● ●

Lottery A vs. Lottery C

There are 100 red and black balls in total in a box. You lose $1,000 if you get a red ball. Nothing for a black ball. Which lottery would you prefer? Please select one of the following options.

● ● ●

Lottery B vs. Lottery C

There are 100 red and black balls in total in a box. You lose $1,000 if you get a red ball. Nothing for a black ball. Which lottery would you prefer? Please select one of the following options.

● ● ●

Problem 2-1 (Problem 1-1 plus the Statistical Equivalence Instruction)

Problem 2-2 (Problem 1-2 plus the Statistical Equivalence Instruction)

These problems had been put on the author's Japanese version Web site from November 22, 1997 to November 21, 2000. Each participant was guided to one problem among Problem 1-1 - Problem 2-2 by using his/her birth-year and month. The announcement of the experiment was posted to Yahoo! JAPAN, net-news and mailing lists.

4. Experimental Results

Table 1 - Table 5 are response frequencies, Table 6 is a sex distribution and Table 7 is an age distribution. The symbols in Table 1 - Table 4 and Fig. 1 - Fi.g. 4 (Appendix) are as follows.

S.S.: Skew Sensitivity
(Negative Skewness ≺ Unambiguous ≺ Positive Skewness)
R.S.S.: Reverse Skew Sensitivity [4]
(Positive Skewness ≺ Unambiguous ≺ Negative Skewness)
A.A.: Ambiguity Averse
(Negative and Positive Skewness ≺ Unambiguous)
A.S.: Ambiguity Seeking
(Unambiguous ≺ Negative and Positive Skewness)
A.N.: Ambiguity Neutral
(Negative Skewness ~Positive Skewness ~ Unambiguous)

Table 1: Response Frequencies for Problem 1-1 (Gain)

S.S.	R.S.S.	A.A.	A.S.	A.N.	No Pattern	Total
23 (27.1%)	3 (3.5%)	10 (11.8%)	10(11.8%)	21(24.7%)	18 (21.2%)	85 (100%)

Table 2: Response Frequencies for Problem 1-2 (Loss)

S.S.	R.S.S.	A.A.	A.S.	A.N.	No Pattern	Total
37 (37.8%)	1 (1.0%)	8 (8.2%)	19 (19.4%)	18 (18.4%)	14 (14.3%)	98(100%)

Table 3: Response Frequencies for Problem 2-1 (Gain)
(Problem 1-1 plus the Statistical Equivalence Instruction)

S.S.	R.S.S.	A.A.	A.S.	A.N.	No Pattern	Total
28 (32.9%)	5 (5.9%)	19 (22.4%)	8 (9.4%)	18 (21.2%)	7 (8.2%)	85 (100%)

Table 4: Response Frequencies for Problem 2-2 (Loss)
(Problem 1-2 plus the Statistical Equivalence Instruction)

S.S.	R.S.S.	A.A.	A.S.	A.N.	No Pattern	Total
22 (28.2%)	6 (7.7%)	6 (7.7%)	10 (12.8%)	20 (25.6%)	14 (17.9%)	78 (100%)

Table 5: Preference Frequencies between the Ambiguity Lotteries
(Lottery B vs. Lottery C)

Problems	N.S. < P.S.	NS. ~ P.S.	N.S. > P.S.	Totals
1-1	41 (48.2%)	25 (29.4%)	19 (22.4%)	85 (100%)
1-2	62 (63.3%)	22 (22.4%)	14 (14.3%)	98 (100%)
2-1	49 (57.6%)	24 (28.2%)	12 (14.1%)	85 (100%)
2-2	40 (51.3%)	24 (30.8%)	14 (17.9%)	78 (100%)

N.S.: Negative Skewness, P.S.: Positive Skewness

Table 6: Sex Distribution

Problems	Male	Female	Totals
1-1	67	18	85
1-2	66	32	98
2-1	64	21	85
2-2	57	21	78
Totals	254	92	346

Table 7: Age Distribution

Problems	10's	20's	30's	40's	50's	60's	Ave. Ages	Min. Ages	Max. Ages
1-1	10	55	17	3	0	0	26.2	14	48
1-2	10	61	21	4	2	0	26.8	16	58
2-1	6	49	19	7	3	1	28.9	12	63
2-2	2	40	28	8	0	0	29.1	17	48
Totals	28	205	85	22	5	1			

1. Without the Statistical Equivalence Instruction

(a) Gain (Table 1 and Fig. 1): The number of the participants was 85 (Japanese: 83, Chinese:1, Korean:1). About 21% of the participants exhibited no systematic preference pattern. About 48% of the participants exhibited a consistent attitude toward ambiguity: 21 participants were ambiguity neutral, 10 participants were ambiguity averse, and 10 participants were ambiguity seeking. 23 of 85 participants (about 27%) were skew sensitive. Moreover, 3 participants exhibited Reverse Skew Sensitivity.

(b) Loss (Table 2 and Fig. 2): The number of the participants was 98 (Japanese: 98). About 14% of the participants exhibited no systematic preference pattern. About 47% of the participants exhibited a consistent attitude toward ambiguity: 18 participants were ambiguity neutral, 8 participants were ambiguity averse, and 19 participants were ambiguity seeking. 37 of 98 participants (about 38%) were skew sensitive. Moreover, One participant exhibited Reverse Skew Sensitivity.

2. With the Statistical Equivalence Instruction

(a) Gain (Table 3 and Fig. 3): The number of the participants was 85 (Japanese: 84, Korean:1). About 8% of the participants exhibited no systematic preference pattern. About 53% of the participants exhibited a consistent attitude toward ambiguity: 18 participants were ambiguity neutral, 19 participants were ambiguity averse, and 8 participants were ambiguity seeking. 28 of 85 participants (about 33%) were skew sensitive. Moreover, 5 participants exhibited Reverse Skew Sensitivity.

(b) Loss (Table 4 and Fig. 4): The number of the participants was 78 (Japanese: 78). About 18% of the participants exhibited no systematic preference pattern. About 46% of the participants exhibited a consistent attitude toward ambiguity: 20 participants were ambiguity neutral, 6 participants were ambiguity averse, and 10 participants were ambiguity

seeking. 22 of 78 participants (about 28%) were skew sensitive. Moreover, 6 participants exhibited Reverse Skew Sensitivity.

3. Preference Patterns between the Ambiguous Lotteries (Table 5)

The Direct comparison between the ambiguous lotteries (Lottery B and Lottery C) indicated that regardless of a gain, a loss and the Statistical Equivalence Instruction, Skew Sensitivity is most common and Ambiguity Neutral follows. There also exists Reverse Skew Sensitivity.

4. The Sex Distribution and the Age Distribution (Table 6 and Table7)

Male participants are most common, and people in their 20's participated most often, with those in their 30's following.

5. Conclusions

A part of Boiney's classroom experiment was conducted from November 22, 1997 to November 21, 2000 on the Web. We obtained results similar to Boiney's. The preference patterns that Boiney revealed were even validated in the case that was given the “statistical equivalent instruction.” The results show the effectiveness of psychological experiments on the Internet. Moreover, Reverse Skew Sensitivity that was theoretically predicted by the author was also observed.

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References

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Appendix
Component Ratios of Preference Patterns

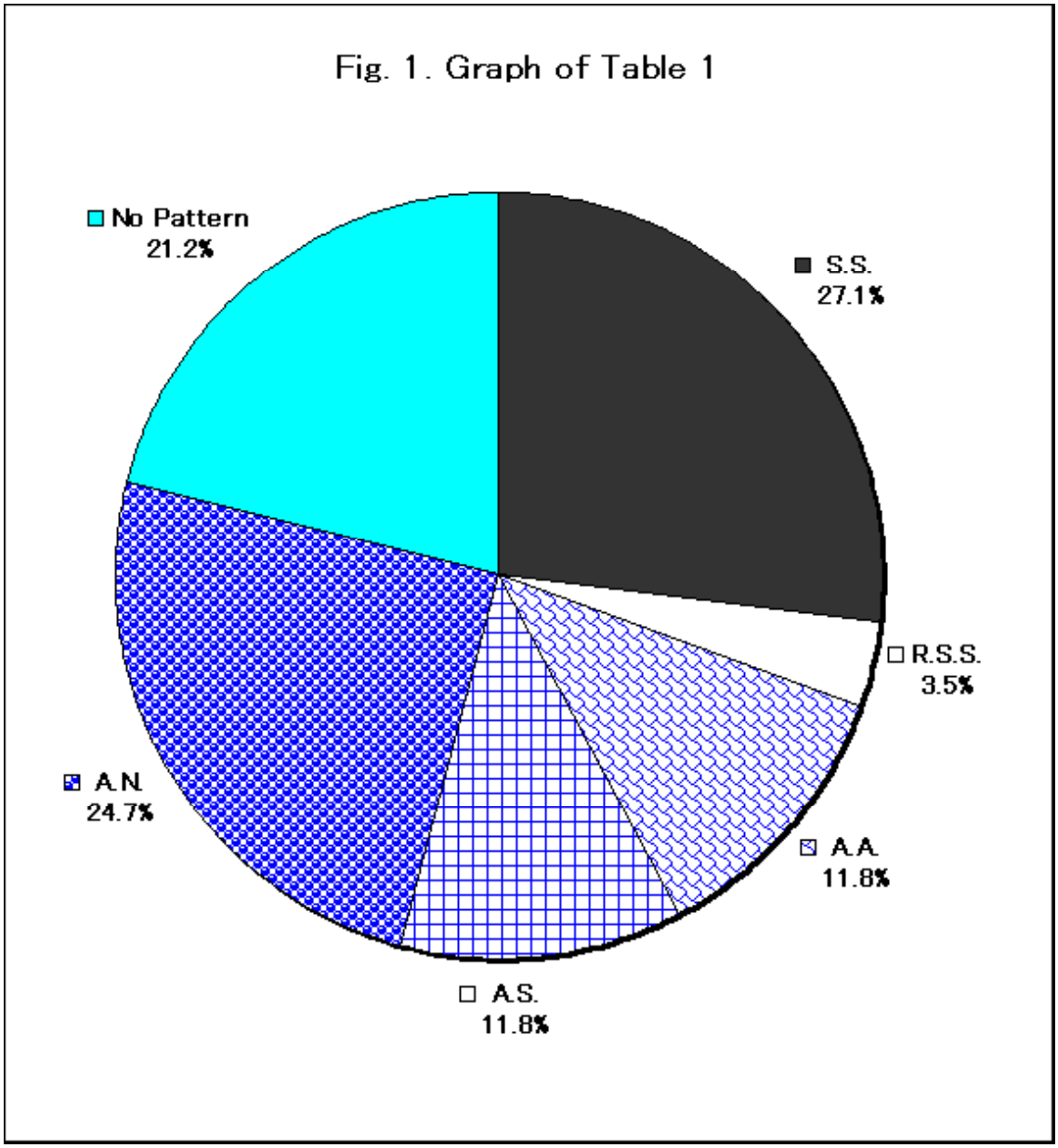


Fig. 2. Graph of Table 2

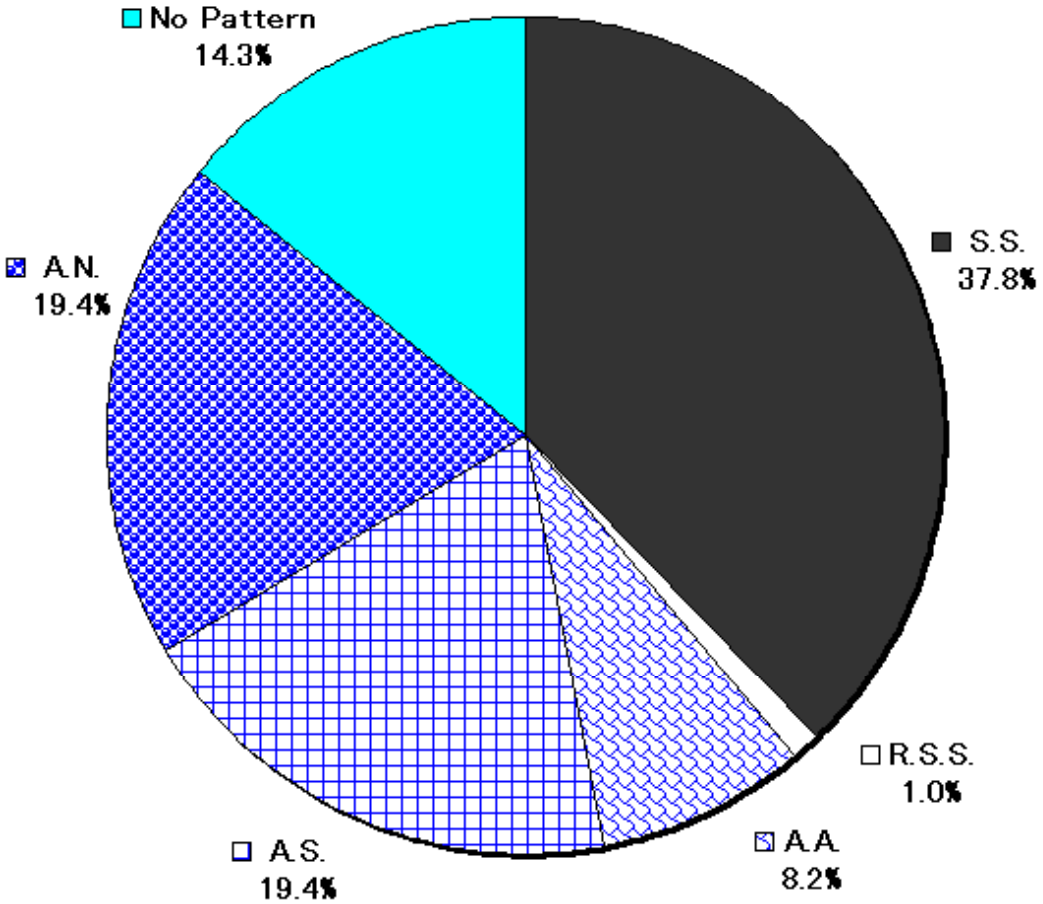


Fig. 3. Graph of Table 3

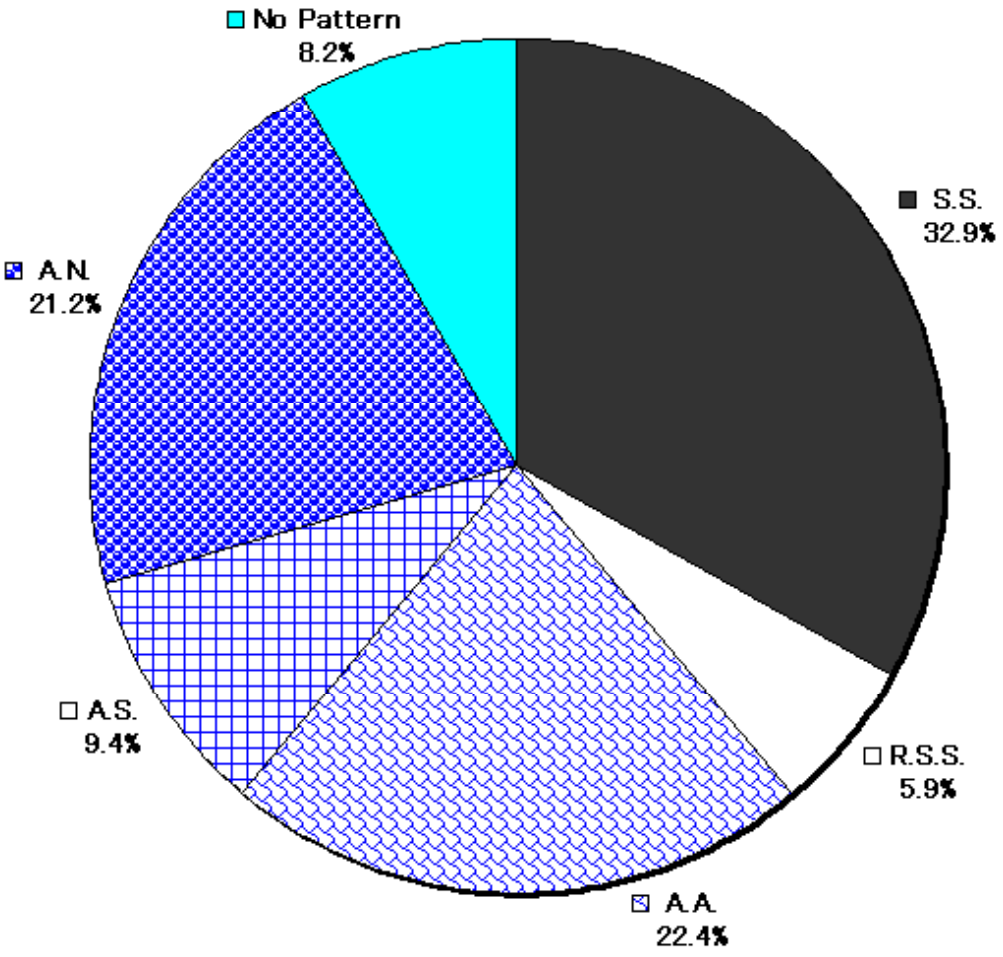
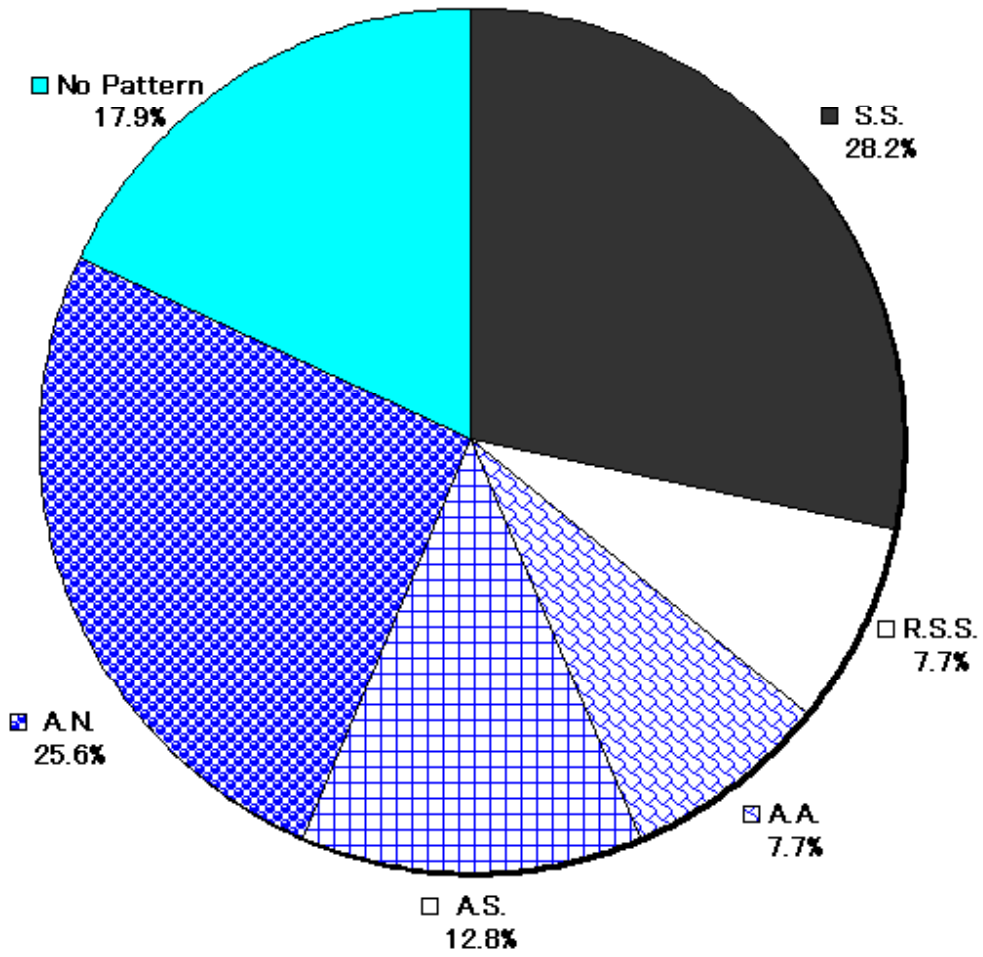


Fig. 4. Graph of Table 4



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